Aquaculture

Aquaculture includes standards on career choices, history, species, anatomy, management, nutrient, health, water quality, production, marketing and leadership skills needed to help students better prepare for careers this area of agriculture. As space for agriculture diminishes and food requirements increase, new methods of production will be necessary for adequate food production and food quality in the 21st century.

Pre-requisites: **None**

Recommended Credit: **½ or 1**

Recommended Grade Levels: **10th, 11th or 12th**

***** **½ denotes learning expectations that must be met when teaching the course for ½ credit.**

****** **All learning expectations must be met when teaching the course for 1 credit.**

Aquaculture

Standard 1.0

The student will evaluate the significance and history of aquaculture as it affects us today and in the future.

Standard 2.0

The student will recommend specific species of aquatic plants and animals for particular uses.

Standard 3.0

The student will evaluate the functions of the internal and external parts of a fish.

Standard 4.0

The student will analyze different management techniques used in producing fresh water species of fish.

Standard 5.0

The student will demonstrate how to raise a fish species.

Standard 6.0

The student will recommend basic nutritional requirements for fish.

Standard 7.0

The student will summarize basic health requirements of fish.

Standard 8.0

The student will examine water chemistry and the role it plays in water quality for freshwater fish.

Standard 9.0

The student will evaluate structures and equipment used in the production of fish and other aquatic species.

Standard 10.0

The student will evaluate the marketing process and development of a business plan.

Standard 11.0

The student will integrate academic competencies with aquaculture.

Standard 12.0

The student will develop premier leadership and personal growth needed for careers in aquaculture.

Aquaculture

Course Description:
The course will include standards on career choices, history, species, anatomy, management, nutrient, health, water quality, production, marketing and leadership skills to help students better understand this area of agriculture.

Standard 1.0

The student will evaluate the significance and history of aquaculture as it affects us today and in the future.

Learning Expectations:
The student will:

1.1	Explain the history of basic aquaculture from marine culture to freshwater culture.	½
1.2	Assess the importance of aquaculture in our society.	½
1.3	Summarize common types of aquaculture in the United States and other countries.	½
1.4	Evaluate the future of aquaculture.	½

Evidence standard is Met:
The student will:

- Compare different careers in aquaculture.
- Summarize reasons why aquaculture is important.
- Specify differences between U.S. aquaculture and world aquaculture.

Integration/ Linkages
Language Arts, Social Studies, Business, Biology, Chemistry, SCANS (Secretary's Commission on Achieving Necessary Skills)

Sample Performance Tasks

- Propose the use of aquaculture to meet world food demands.
- Debate the importance of aquaculture to feed a growing world population.
- Survey local consumers on the demand for aquaculture products.
- Research different types of aquaculture on the Internet.

Standard 2.0

The student will recommend specific species of aquatic plants and animals for particular uses.

Learning Expectations:
The student will:

2.1	Compare species of aquatic animals.	½
2.2	Compare species of aquatic plants.	½
2.3	Relate environmental conditions to aquatic life.	½

Evidence Standard is Met:
The student:

- Select aquatic animals to be raised for food or pleasure.
- Select aquatic plants to be raised for food or decoration.
- Assess characteristics of aquatic plants and animals that make them viable in various areas.

Integration/Linkages
Language Arts, Biology, Ecology, Government, Geography, SCANS (Secretary's Commission on Achieving Necessary Skills)

Sample Performance Tasks

- Describe aquatic life found in local waterway systems.
- Examine a water sample for different aquatic life in the water (pond versus stream).
- Create a chart of all aquatic life in a stream or pond.

Standard 3.0

The student will evaluate the functions of the internal and external parts of a fish.

Learning Expectations:

The student will:

3.1	Differentiate the parts of a fish.	½
3.2	Summarize the function of the parts of the fish.	½
3.3	Discuss physiological differences in aquatic animals.	½

Evidence Standard is met:

The student will:

- Diagram the parts of a fish.
- Compare the function to the parts of a fish.
- Evaluate differences in aquatic life as they relate to environmental conditions.

Integration/Linkages

Biology, Chemistry, Language Arts, Ecology, Geography, SCANS (Secretary's Commission on Achieving Necessary Skills)

Sample Performance Tasks

- Label a drawing with the parts of the fish.
- Complete a drawing of different aquatic life and label major differences between fish and other animal life.
- Complete a fish dissection lab identifying the organs and systems of the fish.

Standard 4.0

The student will analyze different management techniques used in producing fresh water species of fish.

Learning Expectations:

The student will:

4.1	Justify the function of a hatchery.	½
4.2	Summarize spawning and breeding activities for aquatic life.	½
4.3	Specify the different stages of fish growth (fry, fingerling, food sizes and brood fish).	½
4.4	Summarize the types of aquaculture systems, (indoor and outdoor) bait, food, sport and ornamental.	½
4.5	Recommend species of fish that can be grown in Tennessee.	½

Evidence Standard is Met:

The student will:

- Summarize the steps in setting up a hatchery.
- Describe how to spawn one breed of fish.
- Differentiate the importance between the stages of fish growth.
- Describe the difference between several types of aquaculture.
- Develop a list of twenty fish grown in Tennessee for various purposes.

Integration/Linkages

Mathematics, Biology, Ecology, Biology, Chemistry, Geography, SCANS (Secretary's Commission on Achieving Necessary Skills)

Sample Performance Tasks

- Observe fish spawning in a hatchery.
- Use a lab to differentiate sizes of fish.
- Develop presentation on the role a species of fish plays in the environment.
- Create a chart showing the stages of fish growth.

Standard 5.0

The student will demonstrate how to raise a fish species.

Learning Expectations:

The student will:
5.1 Select a fish to raise.
5.2 Describe how to care for the fish.
5.3 Raise one fish species.

Evidence Standard is Met:
The student will:
- Select a fish breed based on the lab's ability to raise the fish.
- Study the fish for its proper care requirements.
- Raise the fish using a lab, outdoor pond or stream.

Integration/Linkages
Biology, Zoology, Chemistry, Mathematics, Ecology, SCANS (Secretary's Commission on Achieving Necessary Skills)

Sample Performance Tasks
- Set up a lab (aquarium or tanks) to experiment on raising fish.
- Chart the nutrient intake and growth of the experimental fish.

Standard 6.0
The student will recommend basic nutritional requirements for fish.

Learning Expectations:
The student will:
6.1 Specify nutritional requirements for freshwater fish.
6.2 Calculate intake needs for fish.
6.3 Evaluate the functions of the parts of the digestive system.
6.4 Analyze different types of feeds.

Evidence Standard is Met:
The student will:
- Determine the nutritional requirements for freshwater fish.
- Calculate a balanced ration for a selected fish species.
- Summarize the function of each digestive part.
- Recommend several by-products that feed can be made from.

Integration/Linkages
Biology, Chemistry, Mathematics, Language Arts, SCANS (Secretary's Commission on Achieving Necessary Skills)

Sample Performance Tasks
- Calculate a balanced ration for a fish using information from the list made in class.
- Collect feed tags from fish feed bags and compare the labels.
- Chart the growth of experimental fish using different types of feed.

Standard 7.0
The student will summarize basic health requirements of fish.

Learning Expectations:
The student will:
7.1 Outline fish health management.
7.2 Evaluate signs and symptoms of common diseases in fish.
7.3 Evaluate common disease prevention and treatment methods.

Evidence Standard is Met:
The student will:
- Determine common fish health concerns.
- Compare various symptoms to different fish diseases and corresponding fish behavior.
- Recommend preventive disease program for fish production.

Integration/Linkages
Biology, Chemistry, Language Arts, Mathematics, Ecology, SCANS (Secretary's Commission on Achieving Necessary Skills)

Sample Performance Tasks
- Create a chart that shows different diseases and their treatments.
- Examine sick fish and evaluate their treatment.
- Evaluate the diseases of fish that a veterinary or lab technician works with.

Standard 8.0
The student will examine water chemistry and the role it plays in water quality for freshwater fish.

Learning Expectations:
The student will:

8.1	Determine water quality factors, which affect the health of fish.	½
8.2	Recommend methods and chemicals needed to change water quality.	½
8.3	Perform common tests on water for fish production.	½

Evidence standard is Met:
The student will:
- Specify water quality factors important to aquatic life.
- Calculate the amount of chemicals needed to change a specific water quality problem.
- Perform common water tests for freshwater fish.

Integration/Linkages
Biology, Chemistry, Mathematics, Language Arts, SCANS (Secretary's Commission on Achieving Necessary Skills)

Sample Performance Tasks
- Analyze a sample water test on lab water or have students bring in samples to test.
- Recommend a treatment for a water sample with chemicals and monitor the results.
- Calculate the amount of bicarbonate or acid to add to change pH of the water.

Standard 9.0
The student will evaluate structures and equipment used in the production of fish and other aquatic species.

Learning Expectations:
The student will:

9.1	Evaluate structures used in freshwater aquaculture.
9.2	Recommend equipment to be used in production aquaculture.
9.3	Research new methods, structures and equipment being used experimentally to grow fish.

Evidence Standard is Met:
The student will:
- Compare the advantages and disadvantages of different types of aquaculture structures.
- Evaluate types of equipment needed to run an aquaculture facility.
- Recommend new technologies to be integrated in the aquaculture facility.

Integration/Linkages
Chemistry, Mathematics, Technology Education, Physics, Language Arts, SCANS (Secretary's Commission on Achieving Necessary Skills)

Sample Performance Tasks
- Propose a plan using the equipment and structure they think would be best suited for fish production.
- Demonstrate the use of the Internet to research new facilities and colleges to find new ideas on fish production and report the findings to the class.

Standard 10.0
The student will evaluate the marketing process and development of a business plan.

Learning Expectations:

The student will:

10.1 Evaluate the process of marketing aquaculture. ½
10.2 Develop a marketing plan for a specific fish species.
10.3 Assess the processing and quality controls needed in aquaculture.
10.4 Prepare income and expense sheets for an aquaculture facility.

Evidence Standard is Met:

The student will:

- Recommend a marketing strategy for a local aquaculture center.
- Develop a sample business plan of a small fish farm.
- Specify factors to consider in quality control.
- Compare different management plans made in class.

Integration/Linkage

Language Arts, Mathematics, Business, Marketing, Government, SCANS (Secretary's Commission on Achieving Necessary Skills), OSHA Standards, TOSHA Standards

Sample performance Tasks

- Divide into groups and create a business plan, including the marketing plan for a local fishery.
- Recommend several buyers of fish products for a local system.
- Develop a quality control chart to ensure proper management of the facility.

Standard 11.0

The student will integrate academic competencies with aquaculture.

Mathematics:

The student will:

11.1 Use math skills through calculation on water quality and feed requirements.
11.2 Calculate nutritional value of feeds.
11.3 Calculate space requirements for raising aquatic life. ½

Science:

The student will:

11.4 Specify biological factors that affect aquatic life. ½
11.5 Specify ecological factors affected by aquatic life production. ½
11.6 Summarize chemical properties that affect the growth of aquatic life. ½

Language Arts:

The student will:

11.7 Use language arts skills through written reports and making oral presentations on aquatic life production. ½
11.8 Demonstrate correct grammatical skills in technical and laboratory reports. ½

Evidence Standard is Met:

The student will:

- Calculate chemicals needed to change water quality.
- Calculate the amount of feed needed for a specific quantity of fish.
- Describe the anatomy, nutritional requirements and needed water quality for fish.
- Give an oral report in class on the use of aquaculture in food production.
- List countries and laws that affect aquaculture production.

Integration/linkages

Mathematics, Science, Biology, Chemistry, Language Arts, Social Studies, Government, Business, Marketing, SCANS (Secretary's Commission on Achieving Necessary Skills)

Sample Performance Task

- List chemicals from the periodic table required to maintain water quality.
- Research a topic and make a oral presentation.
- Use a conversion chart to determine chemicals to add from parts-per-million (PPM) to gram to ounces.
- Calculate feed required to raise a volume of fish to a specific weight.
- Determine fry weight and size, based on water displacement.
- Determine number of fingerlings needed for specific weight sales.

Standard 12.0

The student will develop premier leadership and personal growth needed for careers in aquaculture.

Learning Expectations:

The student will:

12.1 Demonstrate public speaking abilities through oral presentations and participating in career development events. ½

12.2 Recommend supervised agriculture experience program (SAEP) projects that relates to aquaculture. ½

12.3 Develop public relations and citizenship skills necessary to be productive in aquaculture careers.

12.4 Develop work ethics and team building skills used in industry today.

Evidence Standard is Met:

The student will:

- Prepare a presentation for a small group on the importance of the aquaculture industry.
- Compile several SAEP projects that could be developed.
- Lead a group in a discussion on current developments in aquaculture.
- Develop a program of activities to be implemented in the chapter.

Integration/Linkages

Language Arts, Computers, Business, Marketing, Social Studies, National FFA Guidelines for Proficiency Awards and Degrees, SCANS (Secretary's Commission on Achieving Necessary Skills), National FFA Guidelines for Community Education Programs

Sample Performance Tasks

- Lead a group on a tour of your facilities.
- Prepare a six-to-eight-minute presentation on aquaculture.
- Divide into groups and have a debate in class on the importance of aquaculture.
- Set up a SAEP project in class that could be done by students.
- Complete a FFA proficiency application for an area related to aquaculture.
- Participate in FFA PALS program.
- Participate in Food for America Program.
- Participate in America Reads Challenge.